

**IMPLEMENTATION OF COST OF QUALITY IN
PENANG MANUFACTURING COMPANIES:
AN EXPLORATORY STUDY**

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UNIVERSITI SAINS MALAYSIA

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AN EXPLORATORY STUDY**

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**Research report in partial fulfillment of the requirements
for the degree of Master of Business Administration**

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DECLARATION

I hereby declare that the project is base on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at USM or any other institutions.

NAME: LEE HOON TYE

DATE: 29th MAY 2009

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ABSTRAK

Tujuan menjalankan penyelidikan ini adalah untuk menyelidik faktor-faktor yang mempengaruhi kejayaan pelaksanaan sistem kos kualiti dari kilang pembuatan yang terletak di Pulau Pinang, mengkaji perubahan pencapaian kilang selepas pelaksanaan sistem kos kualiti dan mengenal pasti objektif utama dalam perjajakan dan laporan kos kualiti. Antara faktor-faktor yang dipilih termasuk persetujuan pengurusan, kesediaan sumber, berpasukan, latihan / pendidikan dan peranan jabatan kualiti. Methodologi yang digunakan dalam penyelidikan ini adalah melalui soal selidik pos. Sebanyak tiga ratus kilang pembuatan telah dipilih untuk menyertai penyelidikan ini. Peratusan jawapan yang diterima adalah sebanyak 21.3%. Dalam kajian ini, sebanyak 82% daripada tiga ratus kilang menyatakan bahawa kilang mereka ada melaksanakan sistem kos kualiti. Antara perubahan yang dapat menarik perhatian kita adalah pengurangan dalam aspek pengaduan pelanggan, membaik pulih dan sekerap, perbelanjaan jaminan, dan kos kegagalan. Di sebaliknya, jumlah penjualan adalah meningkat. Antara tiga objektif yang paling penting dalam mengenal pasti objektif utama dalam perjajakan dan laporan kos kualiti adalah peningkatan kualiti secara keseluruhan, menentukan matlamat pengurangan kos dan pengukuran perkembangan, dan meningkatkan kawalan aktiviti kualiti. Ujian hipotesis menunjukkan hanya fungsi jabatan kualiti yang mempengaruhi pelaksanaan sistem kos kualiti. Antara batasan penting dalam penyelidikan ini adalah pengumpulan data daripada tiga ratus kilang yang dipilih secara rawak dari kilang-kilang di Pulau Pinang. Jadi keputusan ini tidak boleh digunakan dalam industri yang lain.

ABSTRACT

The purpose of this research is to investigate factors that aided to the success implementation of cost of quality system in manufacturing companies located in Penang, to observe how company performance has change after implementing cost of quality system, and to identify the objectives behind cost of quality measuring and reporting. Among the factors apply in this research included management commitment, resources availability, teamwork, training / education, and role of the quality department. The methodology of the study was a postal questionnaire survey. Three hundred manufacturing companies were selected to conduct in this survey, and the response rate was 21.3%. The finding indicated that almost 82% of the responding companies are implementing cost of quality system. After the implementation of cost of quality, the following remarkable changes were observed: customer complaint, rework and scrap, warranty expenditure, failure cost, and total quality were decreased. Sales volume was increased. The most important three objectives behind the measuring and reporting of cost of quality were overall quality improvement, to set cost reduction targets and measure progress, and improve control of quality activities. Hypothesis testing shows that only Functions of the Quality Department have influence to the implementation of cost of quality system. The major limitation of the study is that the data were collected from three hundred randomly selected manufacturing companies in Penang, Therefore, the results should not be generalized to other industries.

Chapter 1

INTRODUCTION

1.1 Introduction

This chapter introduces the research outline of the study. The chapter illustrates the background, problem statement, research objectives, research questions, definition of key terms, and significance of study.

1.2 Background

For many manufacturing companies, Quality Costs, Material Costs, and Delivery Costs are 3 main key performance indicators to indicate how successful the organization is. Material costs and delivery costs are commonly analyzed and discussed in management level using financial language. Whereas for quality related indicator, it is always measured using percentage of lot accepted, or defective parts per million. It is necessary to present cost of quality in the form of financial language, so that top managements can communicate clearly and effectively. Cost of quality is one of the very useful tools for evaluating an organization's quality initiatives in terms of dollars, and it often points to areas that required improvement.

Some 60 years ago, a new concept, called cost of quality was introduced into total quality management as one of the major component. According to Feigenbaum (1991), in early years, there was the mistaken notion that in order to achieve better quality, it required much higher costs. Also, there was a widespread understanding that quality could not be practically measured and presented in cost term.

According to Besterfield (1998), the efficiency of any business is measured in terms of dollars. Rodchua (2006) also stress that money is the basic language of upper management. Evans and Lindsay (1993) agreed with this by saying that quality problems are translated into the language of money, which top management can easily related. When quality problems expressed as number of defects, it have little impact on top managers, but when quality problems are presented in the form of financial language, top management can easily understand these problems, evaluate the relative importance of quality problems and also identify major opportunities for cost reduction. Dale & Plunkett (1999) also pointed out the measurement of costs allows quality problems to be expressed in the language of management, and allows quality to be treated as a business parameter. All these opinions are in-line with what Juran & Gryna (1988) stated in their book, “The language of money improves communication between middle managers and upper managers”.

As suggested in MS ISO 9004:2000 (Department of Standards Malaysia, 2000), financial measurement is one of the proposed methods for “measurement of the organization’s performance in order to determine whether planned objectives have been achieved.” Results from such measurement and assessment should review in management review in order to ensure that continual improvement of the quality management system is the driver for performance improvement of the organization.

A brief search of the Malaysia quality-cost related literature through Internet, and in several international journals, notice that there is not much has been written about cost of quality management as practiced in Malaysia. Rosnah (2004) in her study on the companies in Malaysia shows that the use of cost of quality has to be increased.

According to her, even though the companies recognize enhancing quality as a means of achieving global competitiveness, only the use of statistical process charts (SPC) and statistical method and thinking indicate implementation whereas the implementation of cost of quality showed only some implementation. Due to the lack of research on cost of quality, readers may have difficulties to find out answer for questions like what is the percentage of manufacturing companies implementing cost of quality system, to what extent did manufacturing companies are adopting cost of quality, and understand the factors aided to the success implementation of cost of quality system. Through this study, it may able to answer the questions of the implementation level of quality cost in Penang manufacturing companies. Furthermore, it can also use as reference to the implementation of cost of quality in Malaysia.

Today, with the advancement of technology, the world distance become closer, and many businesses were deal within a click; the development of accounting software ease the tracking of costing. The current economic conditions make it necessary for all organizations to review and tightly control costs and expenditure for their survival (Laszlo, 1997), and many organizations are focusing to improve quality in order to achieve competitiveness. Rodchua (2006) highlighted that there are more and more enterprises of all sizes are defining their own quality cost requirements, from the collection of scrap and rework costs to the most sophisticated cost of quality in order to continue survive in today's business world.

Suver, Neumann & Boles (1992) stated that the standard theme of total quality management is that poor quality is expensive and high quality does not have to be expensive. According to Feigenbaum (2008), the implementation of total quality

management provides a systematic foundation that allows companies to manage costs and spin them into a competitive advantage throughout their global operation. Sawhney (1991) observed the benefit of a quality system, as measured by the total quality costs, can only be realized in the long run rather than in the short run. The full impact of a specific change in the process is usually only felt later. A major impact of improved quality is the reduction in internal and external failure costs. In the long run, decreasing costs in these two categories usually offset the increase in prevention and appraisal costs. The total cost of quality thus decreases.

Bottorff (1997), in his article mention that, “Today, cost of quality systems are regarded as an essential tool in managing quality. In fact, cost of quality has been incorporated into the bodies of knowledge of the certification programs of such professional societies as ASQC (American Society for Quality Control), the Institute of Management Accountants, and the American Production and Inventory Control Society. In addition, numerous business and engineering graduate schools worldwide have integrated cost of quality into their curricula”. According to Superville & Gupta (2001), corporation like Xerox, General Electric, and Motorola have successfully implementing cost of quality system, reduced their quality costs from 30 percent of sales to 2 percent of sales, and in the meantime, improved the product quality.

1.3 Problem Statement

The principal purpose of this research is to understand the implementation of cost of quality in Penang manufacturing companies. To those who already established cost of quality in their company, this is the opportunity for them to review their implementation

level of cost of quality. For those companies who do not establish cost of quality, this is a way to expose cost of quality concept to them. Through this research, we wish to find out more about the implementation of cost of quality in Penang manufacturing companies.

1. Analyzed factors that aided to the success implementation of cost of quality, namely management commitment; resources availability; teamwork; training / education; and role of the quality department.
2. To investigate the extent to which Penang Manufacturing Companies implementing cost of quality?
3. To evaluate how the company performance has changed after implementing cost of quality.

1.4 Research Objectives

The main objective of this research is to study the implementation level of cost of quality, and the factors aided to the implementation of cost of quality in Penang manufacturing companies.

1. Evaluate factors that aided to the success of the implementation of cost of quality. These factors included management commitment; resources availability; teamwork; training / education; and role of the quality department.
2. The scale of cost of quality in Penang Manufacturing Companies, as percentage of sales turnover.
3. How the company performance has changed after adopting a cost of quality system.
4. Observe the reasons of not implementing cost of quality, if there is any.

1.5 Research Questions

To achieve the above objectives, the study tries to answer the following research question:

1. Does Penang Manufacturing Companies implement cost of quality? If 'no', do they plan to implement in the future?
2. What are the factors that aided to the successful implementation of cost of quality?
3. What is the perceived scale of cost of quality (as percentage of sales turnover) in Penang manufacturing companies?
4. How has the company performance changed after implementing cost of quality?
5. What are the most important objectives behind cost of quality measuring and reporting?
6. To those who not implement cost of quality, what are the reasons for not implementing?

1.6 Definition of Key Terms

For the purpose of this study, the following definitions were referred specifically.

1. Cost of Quality: any cost that would not have been expended if quality were perfect. (Pyzdek, 2003)
2. Total cost of quality: Sum of prevention costs, appraisal costs and failure costs. (Campanella, 1999)
3. Cost of poor quality: The annual monetary loss of products and processes that are not achieving their quality objectives. (Gryna, 2001)

4. ABC model: Activity-base costing model is an accounting procedure for allocating the cost of indirect and overhead expenses to specific activities in proportion to the use of a given resource by that activity. (Campanella, 1999)
5. Management Commitment: Direct participation by the highest level executives in a specific and critically important aspect or program of an organization. (businessdictionary.com)
6. Training: Organized activity aimed at imparting information and/or instructions to improve the recipient's performance or to help him or her attain a required level of knowledge or skill. (businessdictionary.com)
7. Teamwork: The process of working collaboratively with a group of people, in order to achieve a goal. (businessdictionary.com)
8. Resources: Assets, capabilities, organizational processes, firm attributes, information, and knowledge in an organization. (Barney, 1991)
9. Role: Prescribed or expected behavior associated with a particular position or status in a group or organization. (businessdictionary.com)

1.7 Significance of Studies

This study is important since research in cost of quality was not widely studied in Malaysia. Through this study, we wish to create awareness among the Penang manufacturing companies to look into the type of cost of quality, and its role in costing. An effective implementation of cost of quality would help companies to recognizes the area for improvement and invest in the right prevention activities. This paper will contribute to the area of Technology Management in manufacturing firms.

1.8 Organization of Remaining Chapter

This paper was organized in which the current chapter is the introduction. The second chapter is the review of literature that outlines previous studies. Chapter three will illustrate the methodology for this research. Chapter four will presents in details the results and finding of the research, which will be summarized in chapter five. Apart of the summary, chapter five will also stated the research limitation and suggestion for future research.

Chapter 2

LITERATURE REVIEW

2.1 Introduction

For better understanding of the present study, a comprehensive search of previous literature has been undertaken. As such, this chapter was organized in the manner to give an overview of literature, underlying theory, literature review, the hypotheses development, and theoretical framework.

2.2 Literature Overview

According to quality experts Crosby (1979), “quality is free.... What costs money are the unquality things – all the actions that involve not doing jobs right the first time”. He also stated in the same book that quality is measured by the cost of quality which is the expense of nonconformance – the cost of doing things wrong. Juran’s (1988) concept of the cost of poor quality as the sum of all costs that would disappear if there were no quality problems is similar to Crosby’s definition.

Campanella (1999) refer quality costs as the difference between the actual cost of a product or service and what the reduced cost would be if there were no possibility of substandard service, failure of products, or defects in their manufacture.

According to Gryna (2001), the cost of poor quality is the annual monetary loss of products and processes that are not achieving their quality objectives. Therefore, cost of quality concepts is not a passing fad. This concept first appeared in the quality control literature in 1950s (Morse, 1993). Juran’s Quality Control Handbook, published in 1951

by McGraw Hill, contains one of the first discussions of cost of quality. Feigenbaum (1956) in his article proposed the concept of prevention, appraisal and failure cost, or P-A-F model has been the principal method for quality costing. The Quality Cost Committee under the Quality Management Division was established by the American Society for Quality (ASQ) in 1961 to formally develop the technique and to promote its use in industry. In 1967, the committee published *Quality Costs – What and How* and explained in details about quality costs and its definition. However Crosby, through his book – *Quality is free* makes cost of quality popular (Beecroft, 2001).

The American Society for Quality (ASQ) recognizes four categories of quality costs: prevention, appraisal, internal failure and external failure (Campanella, 1999). This typology traces back to the work of Feigenbaum (1956). In United Kingdom, the adopted industry standard for quality costing, published by British Standards Institute is BS 6143, *Guide to the Economics of Quality*, in two parts. Part 1 describes the process cost model base on the principles of total quality management and Part 2 describes the prevention, appraisal and failure costs concept. These categories has been well accepted within the quality and accounting professionals (Dale & Oakland, 1992). Many researchers are referring to these four categories of quality costs – prevention, appraisal, internal failure and external failure, or P-A-F model in their studies (Mitra (1998), Campanella (1999), Ittner (1996), Gupta & Campbell (1995), Beecroft (2001), Shah & Mandal (1999), ...)

As stated in quality management system ISO/TS 16949:2002 (IATF, 2002), clause 5.6 on management review, required an organizations during the management review, part of the management review shall be the monitoring of quality objectives, and

the regular reporting and evaluation of the cost of poor quality as an essential part of the continual improvement process.

Shah and Mandal (1999) concluded that, until today, there is no specific method has been developed by any researchers for detailed categorization of prevention, appraisal, and internal and external failure cost elements. The definition of each category of quality costs is different by its nature of business, size, target markets, products and services, organizations, geographic scope and other considerations. Each individual company must define the specific measurement areas within the business failure cost structure that best fit its own business performance (Feigenbaum, 2008).

2.2.1 Type of Cost of Quality

Feigenbaum (1956) suggested the P-A-F model, which classifies quality costs into prevention, appraisal and failure costs, which widely accepted today. Crosby (1979) in his book “Quality is free” emphasizes that quality means conformance, and therefore, defines the cost of quality as the sum of price of conformance and price of non-conformance. As most of the author are referring quality costs to the traditional P-A-F model, or prevention, appraisal, and failure cost; and each of them has their own definition on each category. Below is the description of the types of quality costs by Campanella (1999).

Table 2.1:

Description of types of quality costs by Campanella (1999)

Preventive Costs	The costs of all activities specifically designed to prevent poor quality in products or services.
Appraisal Costs	The costs associated with measuring, evaluating or auditing products or services to assure conformance to quality standards and performance requirements.
Failure Costs	The costs resulting from products or services not conforming to requirements or customer/user needs. Failure costs are divided into internal and external failure cost categories.
Internal Failure Costs	Failure costs occurring prior to delivery or shipment of the product, or the furnishing of a service, to the customer.
External Failure Costs	Failure costs occurring after delivery of shipment of the product, and during or after furnishing of a service, to the customer.
Total Costs	The sum of the above costs. It represents the difference between the actual cost of a product or service and what the reduced cost would be if there were no possibility of substandard service, failure of products, or defects in their manufacture.

2.2.2 The Perception of the Scale of Cost of Quality

According to Morse (1993), cost of quality in an organization incurs either because its product fails to meet customer expectations or because it is concerned about such a failure. Besterfield (1998) review the importance for a cost of poor quality program quantifies the magnitude of the quality-related costs in the language that management knows best – dollars. The cost of poor quality can exceed 20% of the total sales dollar in manufacturing companies. Dale & Oakland (1992) stated that the amount of quality-related cost depend on the type of industry, business, the way the organization defined of

what is or is not a quality-related costs, the approach to total quality management and the continuous quality improvement activities practiced members in the organization.

According to some researchers, the scales of cost of quality are likely,

- Uyar (2008) in his studies on cost of quality in Turkish manufacturing companies found that the cost of quality are ranges between 0 to 10 percent of organization's annual sales turnover.
- Rodchua (2006) conducted a study with 46 companies in the manufacturing industry and found that the average total cost of quality can range from 2.5% to 5% of sales revenue, or 7-10% of manufacturing expenses; and failure costs are about 70-80% of total cost of quality.
- Cost of quality are likely to range from 5 to 25% of an organization's annual sales turnover or operating costs or employment cost in not-for-profit organizations (Williams, van der Wiele & Dale, 1999). Dale & Oakland (1992) and Kent (2005) also estimate the same percentage figure when they conducted the survey for companies in UK.
- Superville & Gupta (2001) stated that it is common for a Fortune 500 firm to spend as much as 10-30 percent of sales revenues on cost of quality, but the benefits, in terms of increased productivity and cost savings, can be substantial.

2.2.3 Implementation of Cost of Quality

Shah and Mandal (1999) pointed out that to achieve international success; companies must introduce the principles and practices of total quality management. Implementing effective cost of quality has made companies reduce scraps/rework and costs of poor quality. It also has led to the development of a strategic quality improvement plan consistent with overall organizational goals (Rodchua, 2006).

Campanella (1999) in his book “Principles of Quality Costs”, and Evans & Lindsay (1993) in their book “The Management and Control of Quality”, and Gupta & Campbell (1995) discussed in details the steps of implementation of cost of quality. Table 2.3 shown a summarized guideline of implementation of cost of quality:

Table 2.2:

Flow of Cost of quality Implementation

Step	Action	Details
1	To verify with factual costs that a cost of quality can be beneficial to the company	Review and analysis of financial data to determine the general levels of quality costs as they exist today.
2	Obtain management commitment and support	Developing an estimate of the cost of quality, and gain management supports.
3	Established an installation team	The quality cost team should include individuals from throughout the organization.
4	Select an organizational segment as a prototype	More detail example required. A specific area of operation must be exposed to management to show how actual quality costs can be calculated and be eliminated through analysis and corrective actions.
5	The management presentation	Presentation must contain a clear description of the detailed intent of the program and how it will be accomplished.
6	Conduct the planned pilot program	Prove the ability of the system to produce cost-saving results. Resell management on the continued need for the program. Allow system debugging prior to full implementation.
7	Education of all Functions / Training	Key members should be educated in the concepts of a cost of quality and the detailed program plan for implementation.
8	Development of the internal quality cost accounting procedure	To describe each elements of quality cost to be used and to define how and when the actual cost are to be estimated or collected, and assembled.
9	Overall collection and analysis of quality cost data	Data is collected according to the quality cost elements. Analyzed the data over a sufficient period of time.
10	Quality cost reporting and use	Published the report to management and verify current opportunities for improvement.

Even though many companies do not track their cost of quality properly, often only customer return, and internal failure rates, to be considered as quality costs (Sower, Savoie & Renick, 1999). Kumar & Brittain (1995) stressed that the concept of cost of

quality and total cost of quality have become the most powerful management tools for measurement of quality performance. Today, this concept of measuring quality costs was widely accepted by organizations, and these costs are the main topic to top management, and business strategy planning of organizations (Feigenbaum, 1991). Shah & Mandal (1999) pointed out that for implementing an effective cost of quality, categorization and definition of quality elements should be very clear from beginning. According to Superville & Gupta (2001), recent developments in cost-of-quality modeling suggest that there is no correct cost of quality model for a firm, since quality costs are dynamic and constantly changing over time. Chen (1992) in his survey realized that 38% of respondents claimed to have an organized cost of quality, and for those respondents without a cost of quality was that they did not have sufficient expertise to implement such a system. Some firm relies mainly on other internal quality systems or whatever can be gathered from cost accounting data. Many firms are unaware of the availability of quality costs standards, and are only slowly implementing statistical process control and reliability engineering.

There are many factors and measured aiding in the successful cost of quality. Understanding of the factors, measures and problem in implementing cost of quality is vital to a company in setting a proper cost of quality system. Among them, included:

- Management commitment.
- Resources Availability.
- Teamwork.
- Training / Education.
- Role of the Quality Department.

2.2.3.1 Management Commitment

Management commitment is clearly a key factor, which must be present before initiating an implementation process (Hansson, Backlund & Lycke, 2003). According to Bamford & Land (2006), top management commitment is vital to the success of the cost of quality project and must be in place before it begins. According to Goh & Ridgway (1994), with this commitment, management needs to establish a sound quality policy. This policy will include the company's corporate policy, its mission and vision on the quality of the company's products and on its commitment to its customers, together with arrangements for implementation.

Top management need to understand and lead the implementation of cost of quality program. Appointment of the cost of quality program leader must be made by management as well. Gupta & Campbell (1995) pointed out that top management must first determine if the cost of quality concept supports its corporate goals and its operational strategy. According to them, in order to compete in the world marketplace, a firm must either cut costs and become the low-cost producer or differentiate its product and add more value for its customer. Antony (2000) highlighted that management should provide adequate budget and resources for improvement actions on the process / system, as their commitment is crucial for the successful application of projects. Antony, Leong, Knowles & Gosh (2002) in their survey to the Hong Kong industries shows that management involvement and their participation is necessary to lead and facilitate the implementation of projects. Lack of commitment and involvement of top management will lead to the failure of the projects.

A survey conducted by Rodchua (2006) also shows that management support is one of the most significant factors effecting on the program achievement. Effective management support can help in making decision, creating a positive company environment, and providing appropriate tools and resources. She also suggested that the roles of top managers are to establish an organizational culture that favors prevention over correction, organize quality cost steering committee, meet regularly to discuss the work progress of the cost of quality, and provide opportunity for training and learning the costs of quality for involved department managers and supervisors. Crosby highlighted that management role in quality management is one of the crucial requirement for a successful quality improvement implementation. Njie, Fon & Awomodu (2008) found out that commitment of top managers would enable the employees to follow their direction and way of working. Dale & Oakland (1992) stressed that the personal commitment of management to attaining product and service quality in the most economical way. These process need to be led by the head of company and members of the senior management team. Top management must create clear and visible quality values and expectation and incorporate into the daily operations. According to Srinidhi (1998), “the incorporation of quality costs and benefits in financial terms will facilitate the consideration of these costs and benefits in both the strategic and operational decisions made by the organization”. This can be achieved by the development of the cost of quality framework by senior management and required the reporting of quantified and measured values of quality costs. Just as in the case of financial measures, the quality costs were linked directly to the bottom line (Srinidhi, 1998).

If top managers are committed to quality, they should not only actively be involved in quality management and improvement process, but also strongly encourage employee involvement in quality management and improvement process (Zhang, Waszink & Wijngaard, 2000).

2.2.3.2 Resources Availability

Barney (1991) in his article defined resources as “assets, capabilities, organizational processes, firm attributes, information, and knowledge”, and can be classified in terms of physical, human, or organizational capital. Human and organizational capitals are viewed as being the main drivers of competitive advantage because, unlike physical capital, they are not as easily acquired in factor markets (Reeda, Lemakb & Meroc, 2000). Pfeffer (1995) in his book mentioned that people, and their skills and experience are important and consider as an asset to the company.

Pyzdek (2003) noted that the ideal cost of quality accounting system would simply aggregate cost of quality to enhance their visibility to management and facilitate efforts to reduce them. The purpose of measuring cost of quality is to provide broad guidelines for management decision-making and action. Cost of quality data collection can be a very complicated task if it is not define and plan properly at the first place. Current accounting procedure may need to revise to accommodate the cost of quality. The used of computer and advancement of the accounting software definitely ease the job of data collection and analysis. According to Bamford & Land (2006), management information systems were always the best source of cost of quality information. Such system are generally easier to use, quicker and more flexible than other methods of data

collection, if set up properly. Shah & Mandal (1999) also pointed out the there is a necessity that existing accounting system may need to be modified for collecting cost of quality data. Rodchua (2006) also have the similar opinion, by saying that the tools used in data collection and analysis are very important in order to obtain accurate and complete information. Management must set up the cost of quality and methodology that suitable to their requirements and work well with the financial and accounting systems. Sahul, Agnihotri & Sadiwala (2008) encourage organization to fully utilize the latest technology to achieve competitive advantage. Ghobadian & Gallear (1996) noticed that availability of resources was identified as inhibiting factor. He suggests that financial resources did not present any difficulties. An effective system should be user friendly and integrated with cost drivers and collect costs related to incur hidden costs. Chen (1992) in his survey stated that large firms are more aware of the advantage of better quality and have more resources to devote to their implementation. He suspected that perhaps because accounting system at large firms are more detailed, and more easily to capture the cost of quality. Srdoc, Sluga & Bratko (2005) in their research on the implementation of “deep quality concept”, stressed that the features of facilities, tools and technology have to be in accordance with designed processes and objectives.

2.2.3.3 Teamwork

Antony (2000) stressed that teamwork can be fostered through better communication across various departments (e.g. quality, production, logistics, engineering, etc). For the effective application of one project, he suggested to build a team encompassing top management, steering committee and a process action team. With the use of teams, the

business will receive quicker and better solutions to problems. Teams also provide more permanent improvements in processes and operations. Bottorff (1997) stressed that the two reasons for cost of quality system failure are related to teamwork.

- First reason is relying on an individual rather than on a team. According to Bottorff, the skill set required to implement a cost of quality system generally exceeds the individual skills of most managers because cost of quality is not about individuals.
- The second reason is the culture of an organization does not support teamwork. He pointed out that only those company who culturally able to support cost of quality teams continue on their quality journey while those culturally unable often abandon the journey altogether.

This is clear that the success of implementation of cost of quality is not an individual task, but it is team effort. Rodchua (2006) in her survey also found that it is importance to have the cooperation from the financial and accounting departments to the cost of quality. According to her again, department managers should understand and accept the value of looking at information and acting with positive steps towards improvement. Sashkin & Kiser (1993) in their book mentioned that cooperation, not competition, must be the basis for working together. Members in the organization must cooperate and work as a team to accomplish their work with the common aim.

According to Quartararo & Krohn (1999), the cost of quality process should be deployed to everyone in organization in order to fully leverage the collective intelligence of the enterprise. Each individual is responsible to look for poor quality, and take action to eliminate it from the business processes. According to Shah & Mandal (1999), after

draft out the list of cost of quality, it should be discussed with various people in the organization for identification of additional categories, to refine wording and to make decision about broad grouping.

Gupta & Campbell (1995) highlighted that the initial problem in measuring cost of quality is the selection of an appropriate team. Representative from various areas of the company should be integrated into the cost of quality team. Goulden & Rawlins (1997) suggested that in order to achieve the goals of ownership of quality issues and greater general understanding, the teams were made up of representatives from each department involved in the process identified.

2.2.3.4 Role of the Quality Department

Pyzdek (2003), in his book “Quality Engineering Handbook” highlighted that the role of quality department in development and maintenance of the cost of quality system is to provide guidance and support to the accounting department. The support of the accounting department is important whenever financial or accounting matter is involved. Accounting department bears primary responsibility for any accounting matters, including cost of quality system.

According to Lee, Zailani & Soh (2006), the quality department might lead in most of the quality improvement projects and may play a vital role in selecting and introducing quality improvement techniques. Role of the quality department was identified as one of the eight critical factors of implementing total quality management highlighted by Saraph, Benson and Schroeder (1989). Sahul, Agnihotri & Sadiwala (2008) explained role of the quality department, which included autonomy of the quality

department; commitment to development and maintenance of quality; and quality related training to employees.

An organization's quality group is one of the leaders in the practice of gathering and using data to improve products and services. They interact with all other departments in the organization, and have the unique ability to guide the organization toward the use of the cost of quality system. Campanella (1999) suggested that the implementation of cost of quality requires an advocate and champion within the company, and this person normally is the quality manager, it can be anyone. The only requirements are knowledge of cost of quality, a clear view and belief in their application and value to the company. According to Corradi (1994), the accounting department can measure the cash flow and operation of an organization, but many activities within the operation consume such resources without a definitive control process. Mandal and Shah (2002) observed the quality cost collection is a joint responsibility of accounting and quality professionals. Uyar (2008) also have the similar finding that the responsibility for the creation of quality costs falls on the shoulders of accounting/finance and quality.

Fotis, Katerina & Christos (2006) in their investigation on the role of quality managers in Greece, found out that many variables on duties and responsibilities such as the quality manager's involvement in building quality awareness among employees, the focus on customer satisfaction and the emphasis on inter-departmental cooperation on quality improvement scored unexpectedly high. Chang & Lu (1995) in their study on total quality management implementation found that the role of the quality department focuses on inspection and training/education, which occupies about 58 per cent of total

working time. In addition, the quality department has to participate in the development and design of new products during the preliminary, intermediate and final stages.

2.2.3.5 Training / Education

Training and education is one of the important criteria to the success implementation of cost of quality program, and continuing education and training is one of the most vital issues. It is important for everyone involved with the programs to understand the concept and elements of cost of quality. Njie et al. (2008) mentioned that training can provides an opportunity to empower and motivate employees, reducing employee resistance and increases the chances of success.

Antony, et al. (2002) pointed out that training and education is one of the most important factors for the successful implementation of total quality management in Hong Kong industries. These companies spent huge effort and invent on the development of employees and teamwork, as they believe that understood that the staff is an asset to their companies. According to Campanella (1999), key members of each department should be educated in the concepts of cost of quality. During the training, emphasis should be placed on the involvement of all functions, teamwork, and the real opportunities for performance and cost improvement that exist in many functional areas. Besterfield (1998) also suggested that all personnel who will be involved in the implementation of cost of quality system are educated and trained. Hansson et al. (2003) mentioned that training promotes employee belief that the company is investing in them; it also supports understanding and awareness.